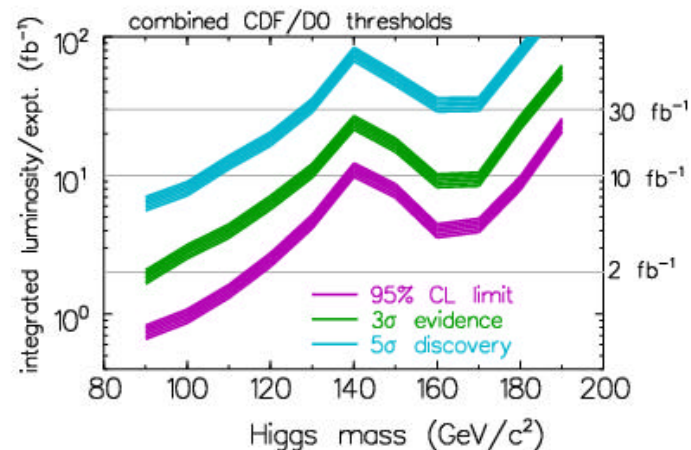
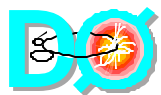


Run 2b Upgrade Status

- ◆ Silicon Tracker Replacement
- ◆ Trigger Upgrades
- ◆ Reviews
- ◆ Project Management
- ◆ Conclusions

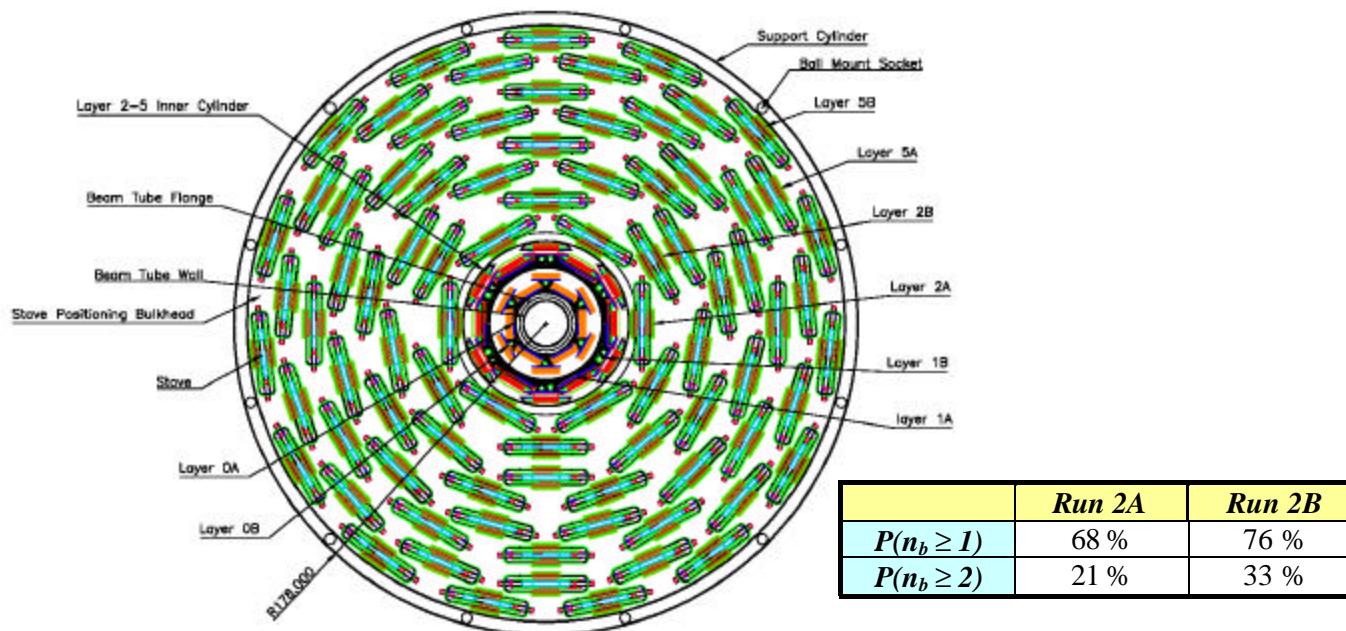


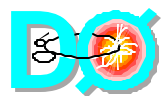
Richard Partridge
Brown University
April 2002 Collaboration Meeting



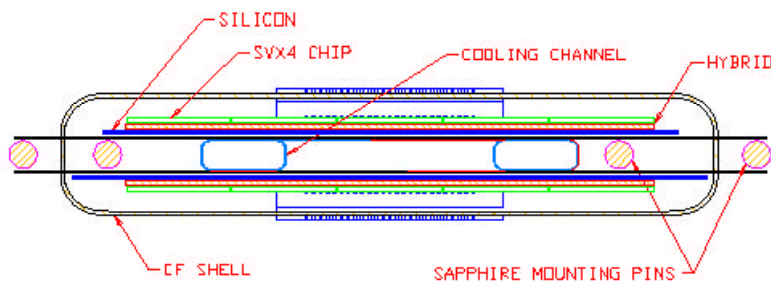
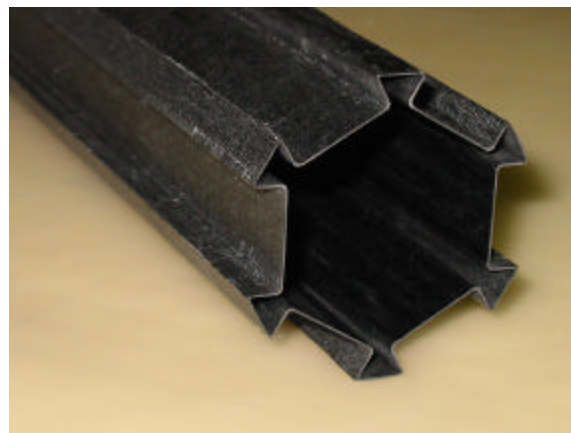
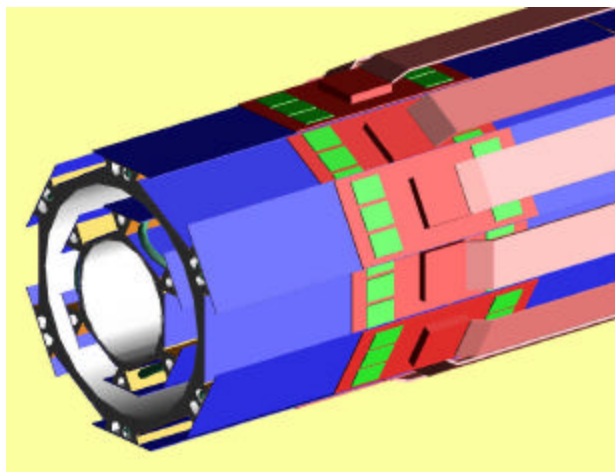
Silicon Tracker Design

- ◆ 6-Layer barrel design with split cylinders
- ◆ Identical staves populate Layers 2-5; axial + stereo
- ◆ Integrated support structures for Layers 0, 1; axial only





Mechanical Design Scrapbook

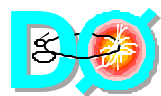




Run 2b Trigger Upgrade

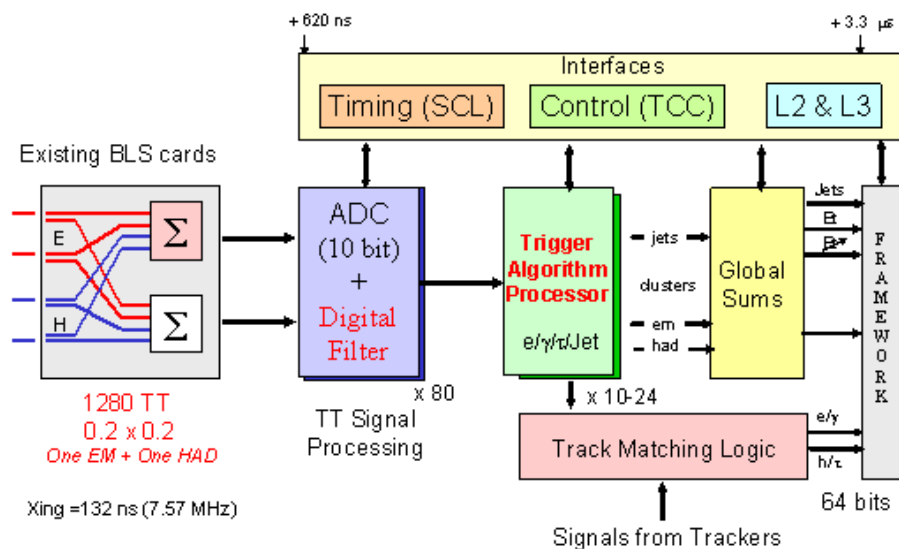
- ◆ Run 2b presents several triggering challenges
 - » Robust triggers needed to meet physics program ($ZH \rightarrow \nu\nu b\bar{b}$, $H \rightarrow \tau\tau$)
 - » Rate of background processes scale up with luminosity
 - » Increased occupancy leads to further increases trigger rates (es p. L1CTT)
 - » Trigger rate limited to Run 2a levels due to readout/DAQ limitations

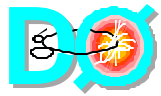
Design for 5 kHz L1 rate, 1 kHz L2 rate for $L = 5 \times 10^{32} \text{cm}^{-2}\text{s}^{-1}$
- ◆ Significant progress has been made in developing detailed plans for the Run 2b trigger
 - » Draft Run 2b Trigger Technical Design Report produced
 - » Level 1: new calorimeter trigger, track trigger upgrade, cal-track match
 - » Level 2: processor upgrade, STT upgrade
 - » Online: L3 processor upgrade, various other online upgrades
- ◆ Urgently need to come to a decision on the scope of the L2 STT upgrade



Level 1 Calorimeter Trigger Upgrade

- ◆ Digital filter to assign energy to correct beam crossing
- ◆ Jet clustering to sharpen trigger thresholds
- ◆ Sliding window algorithm similar to what is used by Atlas
- ◆ Cal-track match utilizes existing design for L1Mu match

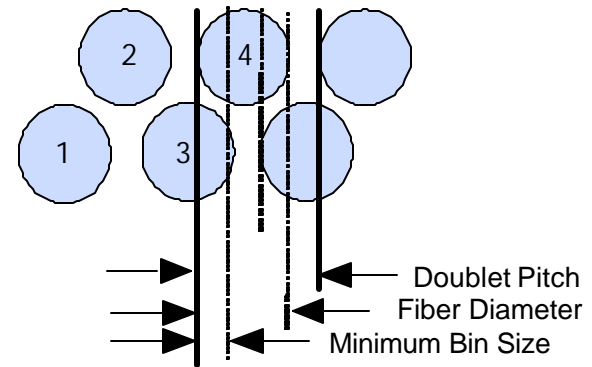




L1 Track Trigger Upgrade

- ◆ Current trigger uses fiber “doublets”
- ◆ Narrow roads by using fiber “singlets”
- ◆ Requires replacement of DFEA daughter boards to increase FPGA resources

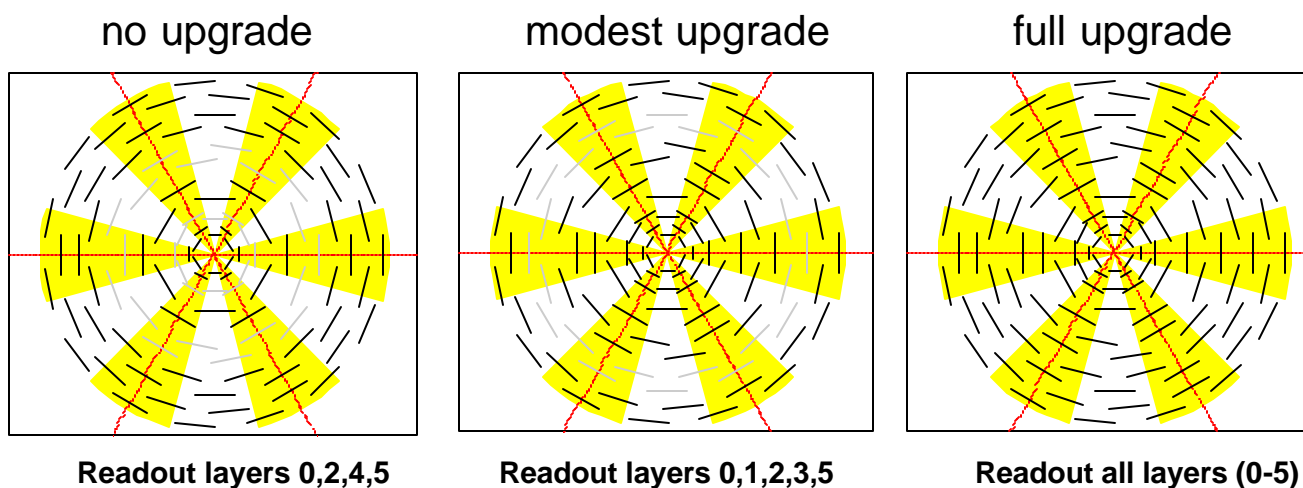
Doublet Layer



	Default Doublet Equations	16-Layer Singlet Equations	12-Layer Equations "abcdEFGH"	12-Layer Equations "ABCDefgh"	14-Layer Equations "abcdefGH"
Efficiency for $p_T > 10$	96.9	99.3	98.6	97.3	99.2
Efficiency for $5 < p_T < 10$	91.1	97.8	92.8	90.8	91.6
Efficiency for fake $p_T > 10$	5.8	0.4	1.6	1.4	0.7
Efficiency for fake $5 < p_T < 10$	8.0	0.7	2.4	2.4	1.6

Silicon Track Trigger

- ◆ Full upgrade (6-layer readout) is in project baseline: \$593k, incl. 48% contingency
- ◆ Modest upgrade (5-layer readout) requires increase in Run 2a production order: \$129k, incl. 59% contingency
- ◆ Studies underway to determine if full upgrade is needed



April PAC Review

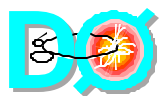
- ◆ Presentations on Run 2a status, Run 2b Triggers, and Simulations of silicon performance
- ◆ June PAC meeting will consider Stage I approval

Alternative Design		Effective luminosity loss relative to TDR design
TDR-L1		– 24% (no inefficiencies) – 44% (with inefficiencies)
TDR-L4	Global tracking	– 12% (no inefficiencies) – 14% (with inefficiencies)
	SMT stand-alone	– 38%
TDR-Z		– 27%

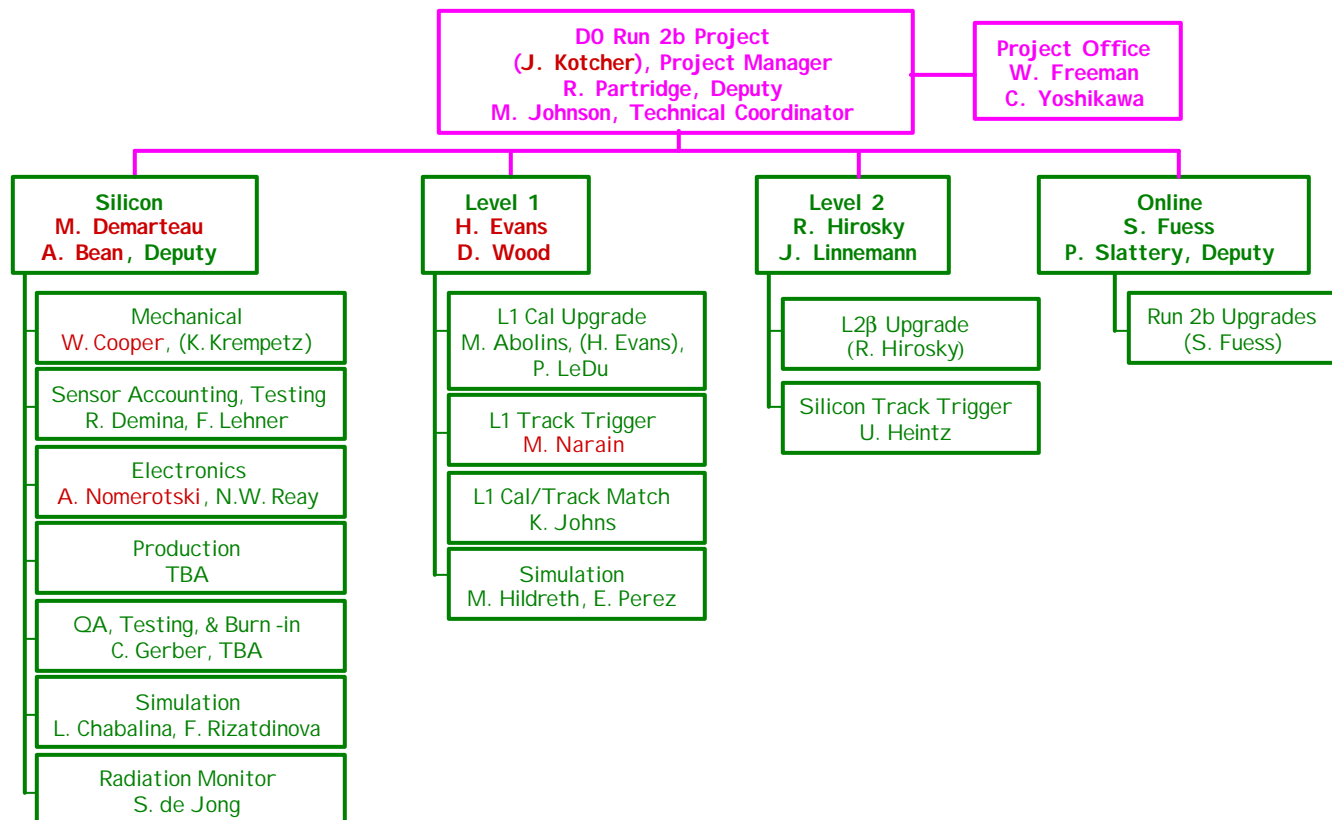


April Director's Review

- ◆ Chaired by Ed Temple
- ◆ Focused on Project Management
- ◆ Goal was to assess readiness for Lehman baseline review
- ◆ Extensive documentation prepared
 - » Updated Silicon Tracker TDR
 - » Draft Trigger TDR
 - » Cost Estimate
 - » Resource Loaded Schedule
 - » WBS Dictionary
 - » Basis of Estimate for cost and schedule
 - » Project Execution Plan (including risk analysis)
 - » Acquisition Execution Plan (joint CDF and DØ)
- ◆ Review was extremely useful in helping us understand the requirements for a baseline review



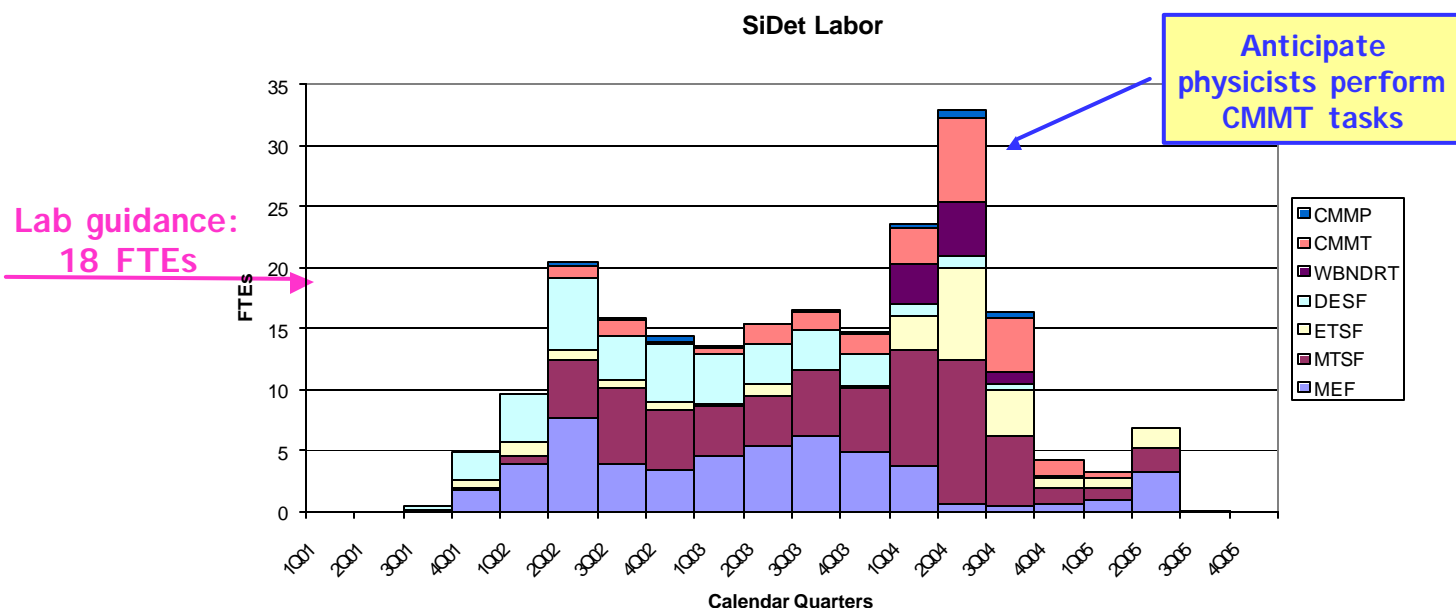
Run 2b Project Organization



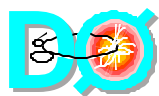


SiDet Technical Manpower

Comparison of anticipated silicon technical FNAL manpower needs with Laboratory guidance for labor available at SiDet



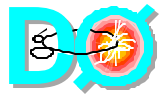
Nominal needs for silicon ~ covered by Lab guidance (contingency not included)



Run 2b Base M&S Funding Summary

Sub-Project	M&S	Cont(%)	Total M&S
Silicon	8740	0.39	12143
Level 1 Trigger	2300	0.32	3033
L1 Cal Trigger	1344	0.26	1691
L1 Cal/Track Match	176	0.28	225
L1 Track Trigger	780	0.43	1117
Level 2 Trigger	474	0.40	662
Level 2β	72	0.37	98
Silicon Track Trigger	402	0.40	564
Online	397	0.19	474
TOTALS	11911	0.37	16312

- Secured funding: \$9.1M (Lab guidance) + \$2.4M (silicon MRI) = \$11.5M
 - Trigger MRI: \$2.3M (decision July/Aug)
 - Assuming trigger MRI, \$2.5M outstanding
- Previous total from Dec '01 Director's Review was \$2.3M lower (\$14M)
 - LABOR: \$0.9M on-project engineering for L1 trigger projects
 - EQUIP: \$0.6M (silicon) + \$0.5M (online) + \$0.3M (L1 Track Trigger)



Total Project Cost Profile

Labor + M&S cost profile extracted
from resource-loaded schedule

	FY01	FY02	FY03	FY04	FY05	FY06	TOTAL	
Silicon	\$82,297	\$3,801,162	\$7,717,751	\$3,167,043	\$727,279	\$43,550	\$15,539,082	
Level 1 Calorimeter	\$0	\$354,155	\$928,799	\$360,242	\$108,680	\$1,720	\$1,753,596	
Level 1 Cal/Track Match	\$0	\$70,790	\$191,430	\$0	\$1,896	\$0	\$264,116	
Level 1 Track Trigger	\$0	\$0	\$216,873	\$754,098	\$9,154	\$0	\$980,125	
Level 2b	\$0	\$0	\$0	\$106,992	\$1,314	\$0	\$108,305	
Level 2 STT	\$0	\$276,582	\$212,970	\$21,116	\$4,118	\$0	\$514,786	
Online	\$0	\$0	\$79,498	\$329,463	\$204,355	\$43,370	\$656,686	
SUB-TOTAL	\$82,297	\$4,502,688	\$9,347,323	\$4,738,955	\$1,056,794	\$88,639	\$19,816,697	
Management reserve	\$30,498	\$1,046,326	\$3,684,895	\$2,696,049	\$614,704	\$66,480	\$8,138,951	\$10,679,757
TOTAL PROJ COST	\$112,795	\$5,549,014	\$13,032,217	\$7,435,004	\$1,671,498	\$155,119	\$27,955,648	
PERCENTAGE BY FY	0%	20%	47%	27%	6%	1%		

- ◆ Total project cost: \$28M
- ◆ Total contingency: \$8.1M (41.1%)

Overall contingency estimate
from Run 2a

Conclusions

- ◆ Significant progress being made in developing technical designs for Silicon and Trigger upgrades
- ◆ PAC and Technical Review committees concur on the need for both silicon and trigger upgrades
- ◆ Need to understand scope of STT upgrade ASAP
- ◆ New environment at DOE in project management
 - » Scope, Schedule, Cost must be established before project is approved
 - » Total project cost (M&S + Labor) is what DOE/Fermilab will monitor
 - » Pressure to meet cost and schedule milestones will be intense
- ◆ Hope to receive Stage 1 approval for Run 2b at June PAC meeting
- ◆ Preparing for Lehman Baseline Review – date TBD
 - » Critical step in obtaining DOE approval for the project